

KNOWLEDGE CONTRIBUTION IN ONLINE QUESTION AND ANSWERING COMMUNITIES: EFFECTS OF GROUPS MEMBERSHIP

Completed Research Paper

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Abstract

Online question and answering community is a popular type of online community for people to seek and share knowledge. After years of development, a recent trend of these communities is to leverage group wisdom by implementing group feature, which allows users to form self-organizing groups and contribute knowledge to the community as group members. This new pattern of user organization poses challenge to extant knowledge sharing literature which so far hasn't considered the effect of group membership on individual knowledge contribution behavior. Drawing on social identity theory, this study proposes that group membership can both directly enhance individual users' knowledge contribution as well as moderate the relationship between the behavioral determinants—MOA (motivation, opportunity and ability) factors and knowledge contribution. A field survey with 367 participants in a leading question and answering community with group feature was conducted to test the research model. Results largely provide support for the model.

Keywords: online question and answering community, knowledge contribution, group membership, social identity theory, MOA framework

Introduction

Online question and answering (Q&A) communities allow knowledge seekers to ask all kinds of questions in natural language for free (Kim et al. 2007) and leverage the time and effort of community users for answers (Harper et al. 2008). These communities, such as Yahoo! Answers, Baidu Knows, and WikiAnswers, are so ubiquitous nowadays that they exert significant impact on the way people share and acquire knowledge. As they can provide knowledge seekers with straightforward answers instead of a long list of possible webpages (Xu et al. 2006; Zhou et al. 2012), they have wisely filled a niche left by mainstream search engines (Liu et al. 2011). However, the ease of use and free accessibility of these communities is insufficient for them to prosper. What is more crucial is rich supply of users' voluntary knowledge contribution.

Up until recently, participants have been answering questions, or contributing knowledge individually in online Q&A communities, without the opportunity to communicate with other community users. In other words, online Q&A communities have been adopting a simple organizational pattern of users as individual units. Lately however, some online Q&A communities such as Baidu Knows, IASK and SOSO WenWen have taken the initiative to move beyond this simple pattern and start to leverage group wisdom by adding the "group" feature into their communities. Specifically, they allow users with similar interests to form self-organizing groups and then contribute knowledge back to the community as group members. In this way, knowledge contributors are no longer individual units; rather they have their pertaining groups, group members, group leaders and collective goals of the group. Meanwhile, group members' knowledge contribution in the community not only adds to their own performance ranking, but also that of the group. Despite the short history of the new group feature, it received users' warm welcome. For example, in two years, Baidu Knows has attracted more than 2 million members forming over forty thousand groups.

Given that knowledge contribution constitutes the key factor that sustains online Q&A communities, whether the group feature really contributes to community development and whether it is worth extending to other types of online communities eventually depends on the answer to the following question: does the introduction of the group feature truly make any difference to users' knowledge contribution behavior? Lots of studies have been done to understand knowledge contribution in various online communities (e.g. Chiu et al. 2006; Ma et al. 2007; Zhang et al. 2010). However, the common assumption they share is that users contribute knowledge individually, without considering the potential effect of group membership. Thus it is unknown whether the new organizational pattern of users, i.e. encouraging them to form groups and contributing knowledge as group members has any facilitating effect on individual user's knowledge contribution or not.

Addressing this issue is important for two reasons: first, for researchers, it bridges the theoretical gap of the unknown effect of group membership in online communities. Equally important, to practitioners it would be important to find out whether the new feature is worth adopting. Driven by these reasons, the research objective of this study is to examine whether the new group feature has any effect on individual user's knowledge contribution behavior. And if so, what are the underlying mechanisms?

We address these questions by integrating the MOA framework with social identity theory. The MOA framework helps us identify three crucial categories of knowledge contribution determinants in the context of online Q&A community, i.e. motivation, opportunity and ability (MacInnis et al. 1991; Rothschild 1999). Within this framework, we are able to further understand the role played by group membership in terms of how it may modify the existing MOA-behavior pattern. To explain the underlying mechanism of group membership, we draw from social identity theory. It is a general theory of group process and intergroup interaction (Hogg et al. 1988b; Tajfel 1982; Tajfel et al. 1979). The theory suggests that group members and non-group members behave in considerably different manner (Tajfel 1982; Tajfel et al. 1979). What distinguishes them is that group members develop a social identity in terms of their group membership (Hogg et al. 1988a). This social identity will in turn invoke some social-cognitive processes that influence group members' behavior.

By investigating the effect of group membership on individual knowledge contribution, this study makes several important theoretical contributions. First, to the best of our knowledge, it is the first study to introduce and understand a new type of user organizational pattern in online community literature. While previous studies focus on understanding knowledge contribution under the traditional user organizational

pattern that treats users as individual units; this study conceptualizes and explains the effect of a new user organizational pattern. Specifically, we reveal its underlying mechanism in both directly and indirectly enhancing group members' knowledge contribution. Second, by integrating social identity theory with the MOA framework, we advance the understanding of the three behavioral determinants by theorizing and empirically testifying the moderating effect of group membership, thereby clarifying one boundary condition of this framework. This study is also highly relevant to practitioners, especially online Q&A community designers, as group feature is still at its early stage and we manage to demonstrate its importance, thus encourage more online communities to implement this feature.

The rest of the paper proceeds as follows: in theoretical background, we present an introduction of social identity theory, group membership and MOA framework. Then we propose the research model and hypotheses. This is followed by a detailed description of the online survey and data analysis. Theoretical and practical implications are discussed, as well as limitations of this study.

Theoretical Background

Social Identity Theory

Social identity theory suggests that when people categorize themselves as members of certain social category, their social identity as group members will emerge (Tajfel et al. 1979). This social identity "confers (people) a shared or collective representation of who one is" (Hogg et al. 1988a). In other words, the group into which one falls generates a social identity that becomes part of people's self-concept and affects his/her behavior.

Social identity invokes two underlying social-cognitive processes. The first is a categorization process, i.e. categorizing people including self into different groups in terms of group membership. It helps clarify intergroup boundary and shape group stereotype (Hogg 1993). It is worth mentioning that this process was elaborated further and finally evolved to a sub-theory of social identity theory, i.e. self-categorization theory (Turner 1985; Turner et al. 1987). The theory posits that the process of categorization accentuates the similarities between group members as well as the difference with other groups. As a result, it leads to a depersonalization effect, meaning that group members perceptually transform a multifaceted group into a group containing similar people matching group prototype (Hogg 2001). This effect transforms people from unique individuals to group members and is essential for group phenomena such as group cohesion and cooperation (Turner 1985).

The second process entailed by social identity is self-enhancement process. It assumes that people have a natural tendency to maintain a positive self-evaluation in terms of their group membership to make it worthwhile. As a result, they will seek to favor their pertaining group over other groups both behaviorally and perceptually (Hogg et al. 1995; Tajfel 1982). That is to say, group members tend to assign more resources to their own groups as the efforts devoted to the group also serve their own interest (Worchel et al. 1998).

Group membership in online Q&A communities

After the introduction of group feature in online Q&A communities, users can be broadly classified into two categories based on whether they have joined any group or not, i.e. contributors working in groups (group members) and contributors working individually (non-group members). We thus define group membership in this context as whether a user has chosen to become a group member of any sub-groups within the overall community.

Both of these two types of users share the same identity as members of the same online Q&A community. However, due to the overwhelming size of the overall community and lack of interdependence among community members, this identity is often found inadequate in generating community members' identification or attachment (Ren et al. forthcoming; Wasko et al. 2005). The myth of the new group feature is that on top of the common identity, it adds to group members a more salient social identity generated by their group membership in those self-organizing groups within the overall community. It is accomplished by gathering members with similar interests together, encouraging them to contribute

knowledge as group members in certain areas that interest the group as a whole and allowing them to communicate with fellow group members. Ren et al. (forthcoming) named this as “bond-based” design, as group members are gathered together due to a group’s characteristic or purpose.

There are several ways documented in the literature regarding how to make the group membership salient to group members through community design. For example, online communities can provide group members with group information and represent individuals as group members to facilitate depersonalization effect (Ren et al. forthcoming). Encouraging groups to create their unique group name, mission statement and providing intragroup communication can also enhance the categorization process (Ren et al. 2007). Besides, research has also found the importance of interdependent reward structure and expectation of future interaction (Worchel et al. 1998). As will be discussed further in the research setting section, online Q&A communities with group feature have already implemented most of the above designs to make group membership salient. Moreover, deciding whether or not to join a group and which group to join is totally up to individual users in this context. As a result, a user who chooses to get attached to a group naturally joins group(s) he/she is interested in and identifies with. This is consistent as what is suggested by the social identity theory (Worchel et al. 1998). It is also suggested by previous study that people identify more with their self-selected groups compared with assigned groups (Bergami et al. 2000). We thus expect that group members can effectively perceive their group membership in this context and feel identified with their pertaining groups.

Previous research has shown that group membership can directly enhance individual performance due to the depersonalization effect (Tajfel et al. 1971), because it aligns people’s behavior with group prototype and makes them more aware of the group welfare. In Tajfel et al. (1971)’s experiment, they randomly assigned participants to groups with unknown fellow group members. They found even this random group membership can lead group members to act in favor of their groups. Besides the direct effect of group membership, its moderating effect on some behavioral determinants has also been hinted in previous research. Research in social identity paradigm shows that when individuals work in a group that they identify with, the effect of motivation on collective action will be strengthened (Van Knippenberg 2000). To further understand how group membership may interact with behavioral determinants and alter group members’ behavioral pattern, we review the MOA framework in the next session to identify the key behavioral determinants in this context.

MOA Framework

The MOA (motivation, opportunity and ability) framework is a well-established comprehensive framework to account for performance outcomes (Blumberg et al. 1982). According to this framework, behavioral outcome is jointly influenced by motivation, opportunity and ability (MacInnis et al. 1989; MacInnis et al. 1991). The MOA framework has been applied in many contexts to explain a wide variety of behaviors such as consumers’ brand information processing (MacInnis et al. 1989; MacInnis et al. 1991), company decision making (Wu et al. 2004), and particularly online knowledge sharing (Argote et al. 2003; Gruen et al. 2005; Siemsen et al. 2008).

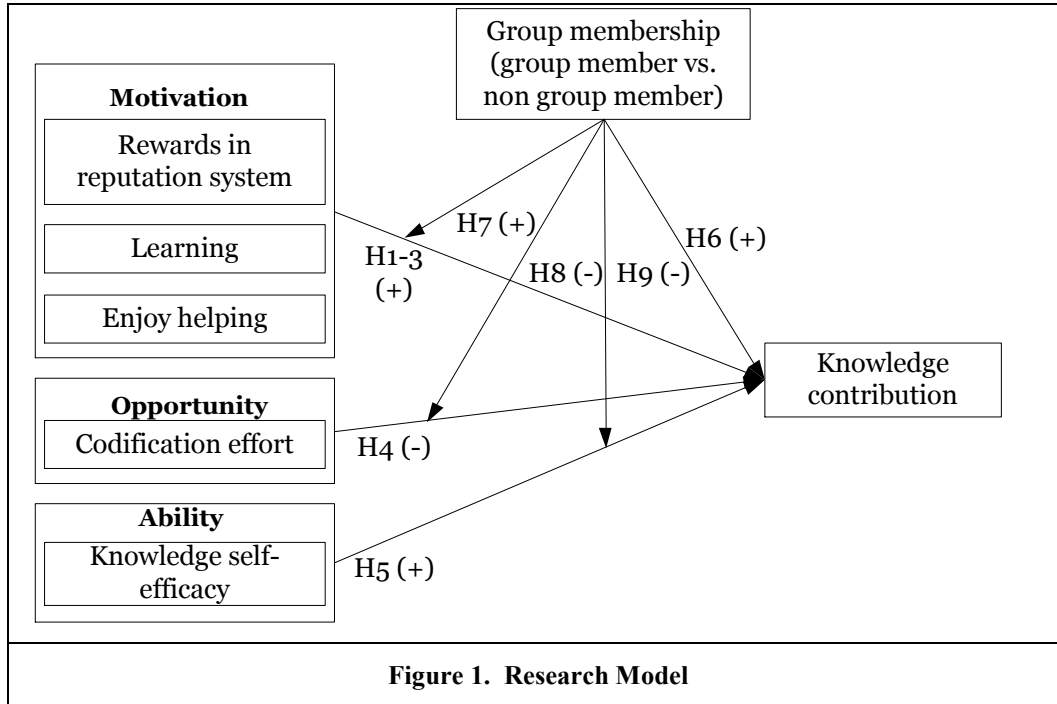
Motivation represents an individual’s psychological force that decides the direction and strength of certain behavior (Kanfer 1990). It influences individual behavior by focusing people’s attention on certain task and producing necessary action to finish the task; the more motivated, the better the behavioral outcome (Roberts et al. 2006). Opportunity in the MOA framework captures the environmental factors that enable the action of interest (Rothschild 1999). While opportunity can be understood from a positive perspective of action enabler, it can also be approached from a negative view of behavioral impediments or constraints (MacInnis et al. 1989). Such situational constraints that have been outlined include time available, attention paid etc. (Gruen et al. 2005; MacInnis et al. 1989). Apart from motivation and opportunity, ability is also an indispensable factor in the MOA framework. It refers to people’s skill or knowledge related to the action (Rothschild 1999).

While most MOA studies address the direct relationship between the MOA factors and behavioral outcomes (e.g. Argote et al. 2003; MacInnis et al. 1991; Siemsen et al. 2008), there are a few studies showing some boundary conditions of MOA factors. Kankanhalli (2005) for example, found that the effect of extrinsic motivation is moderated by contextual factors such as identification and pro-sharing norms. Moreover, they also found one opportunity factor, codification effort, is moderated by trust. Indeed, under

different circumstances, the effect of MOA factors may not be stable. However, it remains uninvestigated as to how the shift of user organizational pattern from individual contribution to group forming can potentially influence users' knowledge contribution pattern. Our study will address this gap by comparing the MOA-behavior relationship of group members against individual contributors.

Research Model and Hypotheses Development

Based on an integration of MOA framework and social identity theory, the research model (Figure 1) is proposed. As the foundation of understanding the effect of group membership, we start with examining the direct effect between MOA factors and knowledge contribution in the context of online Q&A community. Then, group membership, the focus of this study, is proposed to affect knowledge contribution both directly and indirectly by moderating the relationship between the MOA factors and knowledge contribution.



MOA Factors

A wide variety of motivations for voluntary knowledge contribution have been identified in previous literature (e.g. Daugherty et al. 2005; Kankanhalli et al. 2005; Wasko et al. 2005). Nevertheless, most of them can be categorized into the three motivational types summarized in the self-determination theory (Deci 1972; Ryan et al. 2002), a prominent motivation theory in social psychology. According to the self-determination theory, motivations are first broadly divided into intrinsic and extrinsic motivation. Intrinsic motivation derives from the inherent satisfaction of the behavior *per se* (Deci et al. 1985; Ryan et al. 2000). In contrast, extrinsic motivation focuses on contingent outcomes that are separable from the action (Ryan et al. 2002). It can be further divided into external regulation and extrinsic motivation by internalization, or “internalized extrinsic motivation” (Roberts et al. 2006).

External regulation is totally imposed by external force, referring to being motivated to obtain rewards or avoid punishment. Given the free nature of most online Q&A communities, traditional external regulation such as monetary rewards and job promotion (Bartol et al. 2002; Bock et al. 2005; Kankanhalli et al. 2005) are not possible. As an alternative, many online Q&A communities implement an artifact that we name as “rewards in reputation system” to function as the major incentive (Lou et al. 2011). The basic idea of such rewards is the same as traditional rewards: if a user contributes knowledge, certain scores shown in various presentation formats will be raised. With raised scores, participants' performance ranking in

the community can be raised; some online Q&A communities such as IASK allow users to convert these virtual scores into actual gifts. Motivated to get higher performance ranking, and to exchange virtual rewards into actual gifts, users are likely to contribute more valid knowledge. Therefore, we propose that:

H1: Rewards in reputation system are positively associated with participants' knowledge contribution.

Internalized extrinsic motivation, lying between external regulation and intrinsic motivation, refers to external values that become one's own through internalization. Learning, which we define as the belief that contributing knowledge can benefit self-learning, falls into this category. It is a kind of internalized extrinsic motivation since it does not stem from the internal enjoyment of the activity per se, but is a social value that is internalized by knowledge contributors (Lou et al. forthcoming). In online Q&A communities, contributing knowledge benefits individuals in practicing and consolidating their knowledge, as contributors need to search their knowledge pool to answer others' questions (Yu et al. 2007). Moreover, they can also learn from others when browsing through existing question-answer pairs, thereby accumulating new knowledge. These benefits will motivate users to engage in effective knowledge sharing more frequently. Therefore, we propose that:

H2: Learning motive is positively associated with participants' knowledge contribution.

Enjoy helping is framed as the intrinsic motivation, to be consistent with self-determination theory and previous knowledge sharing studies. It refers to the perception of pleasure gained from helping fellow users by contributing knowledge (Wasko et al. 2000; Wasko et al. 2005). This motive represents individual's energy when pursuing a goal or doing an activity due to its innate interest (Deci et al. 1985). It drives more valid knowledge contribution, because participants can feel personal enjoyment in sharing knowledge as well as helping others in need (Lin 2007; Wasko et al. 2000). Therefore, we propose that:

H3: Enjoy helping is positively associated with participants' knowledge contribution.

As mentioned above, opportunity factor can be understood from a negative view of behavioral impediments or constraints (MacInnis et al. 1989). Thus, codification effort, referring to the time and effort required to codify and input knowledge into online Q&A communities (Kankanhalli et al. 2005) is conceptualized as the most relevant opportunity factor in this context. Because time and effort are substantial exogenous factors that constrains the knowledge sharing behavior (Ba et al. 2001). The time spent in codifying knowledge can cause opportunity cost to some people, which has been demonstrated as an impediment of knowledge sharing (Orlikowski 1993). Other than time, effort also forms a significant behavioral constraint (Agarwal 2000). According to the MOA framework, when the magnitude of opportunity fact is low, i.e., the codification effort constitutes a big concern to participants, the likelihood of behavior will be compromised (MacInnis et al. 1991). Therefore, we hypothesize that:

H4: Codification effort is negatively associated with participants' knowledge contribution.

Knowledge self-efficacy, referring to user's confidence in his/her ability to provide knowledge that is valuable to other users (Bandura 1986; Kankanhalli et al. 2005; Wasko et al. 2005) is conceptualized as the ability factor in this context¹. Without sufficient knowledge self-efficacy, participants are unlikely to contribute knowledge since they feel they have nothing to contribute (Wasko et al. 2005). In contrast, users with high knowledge self-efficacy are more inclined to contribute knowledge since they have the confidence that their information can help (Kankanhalli et al. 2005). In the meantime, endowed with a better mastery of knowledge, participants with high knowledge self-efficacy contribute more useful knowledge (Constant et al. 1996). Therefore, we hypothesize that:

H5: Knowledge self-efficacy is positively associated with participants' knowledge contribution.

¹ In a broad sense, knowledge self-efficacy has been classified as a motivational factor in previous research (e.g. Kankanhalli et al. 2005; Lin 2007; Lou et al. forthcoming). However, the MOA framework requires us to distinguish motivation from ability and define motivation in a stricter sense. As knowledge self-efficacy reflects people's perception of what they can do with their knowledge (Bandura 1986), therefore captures users' confidence in their ability; it is more appropriate to conceptualize it as an ability factor as compared with a motivator in within this framework.

Group Membership

Based on the three kinds of behavioral determinants identified above, we proceed to explain how group membership may modify the existing behavioral pattern. We adopt two explanatory mechanisms that have been mentioned in previous studies: one is direct relationship (e.g. Colazo et al. 2009; Simon et al. 1998) between group membership and performance, the other is that group membership can act as a moderator, i.e., it can amplify or dampen the existing relationship between behavioral determinants and behavioral outcomes (Van Knippenberg 2000).

Direct effect

We theorize that compared with community participants who contribute knowledge individually, those who join groups, share knowledge as group members are more likely to contribute knowledge. In a classic experiment of group process, subjects were divided into groups on random basis. Even this random classification leads subjects to act in favor of their own group, indicating a direct effect between group membership and collective action (Tajfel 1982; Tajfel et al. 1979). This phenomenon can be explained by the joint effect of categorization process and self-enhancement process associated with social identity. The categorization process posits that identification with the group gives rise to a feeling of “oneness” with the group. As a result, group members gradually take the group interest as their own (Dutton et al. 1994). Meanwhile, the self-enhancement process urges group members to act in favor of the group outcome.

In comparison with subjects in the classic experiment, group members in online Q&A communities share similar interests in certain topic. The similarity will lead to even stronger identification (Tajfel 1982). The enhanced identification with group can in turn promote collective action (Simon et al. 1998), which is knowledge contribution in this context. Therefore, we hypothesize that:

H6: Group membership is positively associated with participants' knowledge contribution.

Moderating effect

Motivation, referring to individual willingness to act (Kanfer 1990; MacInnis et al. 1991), exerts its influence on individual behavior by focusing people's attention on certain task and thereby producing necessary action to finish the task (Roberts et al. 2006). The literature on social identity shows that for group members who effectively perceive high performance as collective goal and in group's best interest, motivation is more likely to convert to actual behavior (Van Knippenberg 2000). This is because group members are more prepared to act in favor of group outcome due to the categorization and self-enhancement processes. As a result, motivation can more effectively focus group members' attention on the task, thereby generating higher performance. In those groups within online Q&A communities, every group member's knowledge contribution is crucial for collective group goal; the more group members contribute, the higher performance can be achieved by the group, and the more likely the group can get rewarded. That is to say, group members can effectively perceive that knowledge contribution is in group's best interest. In contrast, for participants working individually, although contributing knowledge is in the community's best interest, they are usually not as committed to the overall community's interest due to lack of interdependence, frequent interaction and shared interest with other community members (Nahapiet et al. 1998; Wasko et al. 2005). As a result, motivation is less likely to convert to actual behavior for contributors working individually. Therefore we hypothesize that:

H7: The effect of three motivations on knowledge contribution is stronger for contributors working in groups as compared to contributors working individually.

Codification effort as the opportunity factor in the MOA framework poses situational constraint to knowledge contribution. However, we argue that, for users who join groups and contribute knowledge as group members, the constraining effect of codification effort will be weaker compared with individual users. Due to the categorization process and the associated depersonalization effect, group members treat themselves as similar ones matching group stereotype, thus less aware of the effort specific to them. In the meantime, group members gradually derive a positive self-image for their group membership (Tajfel et al. 1979). To make the group membership rewarding, the self-enhancement process will drive group members to maintain the positive self-image. As a result, group members tend to overlook the required

time and efforts in order to realize the group objective (Dholakia et al. 2004; Hogg et al. 1988a). Previous knowledge sharing research has shown that when there is strong identification, people tend to forgo their concern for the needed effort for the sake of collective outcome (Constant et al. 1996; Kankanhalli et al. 2005). As to contributors working individually, similar with the case for motivation, since they lack strong concern for the community interest due to the large size of the community and lack of interdependence with other community members, they tend to regard codification effort a more salient impediment. To briefly sum up the above argument, when users contribute knowledge as group members, they will tend to overlook the constraining opportunity factor, codification effort, since they want to achieve their group goal so as to maintain self-esteem. Therefore we hypothesize that:

H8: The effect of codification effort on knowledge contribution is weaker for contributors working in groups as compared to contributors working individually.

Knowledge self-efficacy renders participants the ability to contribute valuable knowledge. Participants are reluctant to contribute knowledge if they do not perceive their knowledge self-efficacy high enough (Wasko et al. 2005). Thus, knowledge self-efficacy can be understood as individuals' concern about their innate ability, which can sometimes withhold their knowledge contribution behavior. In line with this argument, Pavlou and Fygenson (2006) categorized self-efficacy as one of the underlying dimensions of perceived behavioral control, referring to individual perception about the difficulty of carrying out certain behavior (Ajzen 1991). We argue that when contributors work in groups, their concern for knowledge self-efficacy can be alleviated. Quite similar with the case for codification effort, since participants in groups experience depersonalization effect, their self-awareness is weakened as they regard themselves interchangeable with other members in the group (Hogg 2001). Meanwhile, since they are eager to achieve collective goal so as to maintain positive esteem due to the self-enhancement process, they tend to overlook the concern for their own internal impediment, knowledge self-efficacy. Therefore, the effect of knowledge self-efficacy on knowledge contribution is attenuated. In contrast, for those working individually, knowledge self-efficacy is a stronger predictor of knowledge contribution behavior since they cannot effectively perceive the community interest as their own and will thus contribute knowledge mainly for their own sake. Therefore we hypothesize that:

H9: The effect of knowledge self-efficacy on knowledge contribution is weaker for contributors working in groups as compared to contributors working individually.

Methodology

Research setting

Baidu Knows, a leading online Q&A community in China, was chosen as the survey site. Same as typical online Q&A communities, it organizes knowledge exchange in the form of question and answering, and covers a wide range of topics such as education, computer skill, relationship, etc. The knowledge exchange process in Baidu Knows is as follows: first, an asker posts a new question and assigns it to a predefined category. Then, this question will be "open", awaiting answers for a certain period. When the answer is "closed", it is time for best answer selection. To evaluate the answers, the asker can choose a best answer himself/herself, or he/she can leave it for other community users to vote.

Individual knowledge contribution was the sole knowledge contribution pattern in this community until Jan. 28, 2010 when this community introduced the group feature, which allows users to form self-organizing groups. Specially, users reaching a certain level can create his/her group, assign it to a category to indicate the specialty of the group and then start recruiting members with similar interest or specialty. For other community members who are not senior enough to start their own groups, they can voluntarily join up to three groups they are interested in. After joining groups, members can easily access group information in their Baidu Knows homepage, including a list of questions waiting for group members to answer and recent group performance. Group members' group information will also be shown in their profile page. Additionally, there are discussion boards and internal message system available for group members to discuss issues such as difficult questions and group management. When group members answer questions or get their answers accepted as the best answer, not only will the individual member gets rewarded in the form of points in the reputation system but also his/her group. Individual group

member's performance then aggregates into group performance.

Data collection

We invited community users to participate in the online survey via the internal message system provided by the community. The data collection process lasted for three weeks and lead to 381 responses. When filling in the questionnaire, respondents were required to input their username so that we can check whether they are a group member or not. Among the 381 responses, 4 were deleted since they come from the same IP address and another 10 were deleted since we cannot retrieve the user information in the community according to the username they provided. Therefore, we have a total of 367 valid responses. Based on the username they provided, we checked each respondent's group status. Among them, 208 are group members and 159 are non-group members. Generally, the group members and non-group members share similar demographic information.

Instrument

The majority of measurement items are adopted from previous studies to ensure validity and reliability (see Appendix A). Some slight adjustments are made for some items to better suit the context of online Q&A communities. The measurements are all assessed using seven-point Likert scale ranging from 1=strongly disagree to 7=strongly agree except for group membership. For this construct, we use the username participants provided in the questionnaire to check their membership information in the community and coded "0" for non-group members, "1" for group members.

The dependent variable, knowledge contribution is a second-order formative construct measured by two first-order constructs, knowledge contribution quality and quantity, as they have been demonstrated as two crucial dimensions of knowledge contribution (Chiu et al. 2006; Lou et al. forthcoming). The four items for knowledge contribution quantity are adapted from Ma & Agarwal (2007) and Yu et al. (2011). The seven items or knowledge contribution quality come from Chiu, et al. (2006)'s study with an additional item about contributors' overall assessment of their own knowledge contribution quality. For the three motivation factors, the four items for the construct "rewards in reputation system" is developed by replacing organization rewards in Kankanhalli, et al.(2005) with common rewards in reputation systems like "experience points", "virtual wealth" etc. For the construct learning, we adopt the measurement items from several resources (Clary et al. 1998; Nam et al. 2009; Yu et al. 2007). The four items for the construct enjoy helping, are adapted from Kankanhalli, et al. (2005). The four items measuring codification effort, the opportunity factor and the four items measuring knowledge self-efficacy, the ability factor, are all adapted from Kankanhalli, et al. (2005)

Control variables

We included several control variables in the analysis. Community tenure is believed to influence knowledge contribution under the assumption that the more experienced a user is, the more likely they will contribute knowledge (Ma et al. 2007; Roberts et al. 2006). Education level likewise influences knowledge contribution (Roberts et al. 2006), especially the quality part. Finally, gender and age are believed to exert significant influence on user behavior in online communities (Garbarino et al. 2004; Herring 2000), especially their reaction to virtual gifts (Yee 2006) like rewards in reputation system in this context.

Data Analysis

Measurement model

SmartPLS 2.0 was used for data analysis. This is because the dependent variable, knowledge contribution, is modeled is a second-order formative construct that consists of two first-order constructs (knowledge contribution quantity and quality). PLS is regarded more appropriate under this circumstance compared

with covariance-based SEM (Chin 1998a; Hair et al. 2011).

Anderson and Gerbing (1988)'s two-step approach was adopted in examining the measurement model and structural model. First, we assessed the descriptive statistics, reliability and validity of the overall sample, group member sample and non-group member sample separately (see Table 1). Reliability was examined by composite reliability. Result show that values of composite reliability for each of the constructs well exceeds the 0.7 cut-off (Fornell et al. 1981), confirming the internal consistency of instruments. To test convergent validity, average variance extracted (AVE) was assessed. As we can see in Table 1, all AVE values are above the threshold 0.5 (Chin 1998b). Table 1 also assessed discriminant validity. It was done by comparing construct correlations and the square root of AVEs (Fornell et al. 1981). As shown in Table 1, the square root of AVE (diagonal elements) for each construct is larger than its correlation with other constructs (off-diagonal elements).

Table 1. Reliability, validity and descriptive statistics											
Construct	Mean	SD	CR	AVE	Construct						
					RS	Learning	Enjoy	Effort	Efficacy	Quantity	Quality
Overall											
RS	4.23	1.58	0.90	0.69	0.83						
Learning	5.63	1.11	0.92	0.69	0.04	0.83					
Enjoy	5.90	1.11	0.91	0.73	0.13	0.64	0.85				
Effort	3.05	1.32	0.90	0.65	0.10	-0.08	-0.20	0.81			
Efficacy	5.41	1.23	0.93	0.87	0.15	0.51	0.54	-0.08	0.93		
Quantity	5.22	1.27	0.94	0.81	0.20	0.51	0.60	-0.12	0.57	0.90	
Quality	5.65	0.98	0.93	0.67	0.13	0.47	0.50	-0.12	0.63	0.63	0.82
Non group member											
RS	4.07	1.52	0.86	0.61	0.78						
Learning	5.54	1.04	0.92	0.71	0.09	0.84					
Enjoy	5.80	1.07	0.91	0.73	0.11	0.66	0.85				
Effort	2.96	1.26	0.91	0.67	0.07	-0.14	-0.22	0.82			
Efficacy	5.31	1.11	0.91	0.83	0.12	0.52	0.53	-0.10	0.91		
Quantity	4.74	1.30	0.95	0.83	0.18	0.49	0.49	-0.09	0.55	0.91	
Quality	5.46	0.99	0.92	0.61	0.10	0.42	0.44	-0.18	0.64	0.56	0.78
Group member											
RS	4.34	1.62	0.91	0.72	0.85						
Learning	5.68	1.17	0.91	0.68	0.03	0.82					
Enjoy	5.97	1.13	0.92	0.73	0.16	0.63	0.85				
Effort	3.11	1.36	0.88	0.59	0.15	-0.08	-0.22	0.77			
Efficacy	5.48	1.30	0.94	0.89	0.18	0.51	0.55	-0.11	0.94		
Quantity	5.54	1.14	0.93	0.77	0.19	0.59	0.61	-0.15	0.62	0.88	
Quality	5.78	0.95	0.94	0.71	0.13	0.52	0.54	-0.10	0.64	0.67	0.84
Note: RS-Rewards in reputation systems for quantity; Enjoy-Enjoy helping; Effort-codification effort; Efficacy-Knowledge self-efficacy. The numbers in bold in the diagonal row are square roots of AVE.											

To further confirm discriminant validity and convergent validity, confirmatory factor analysis (CFA) was also conducted. It shows that across the three groups of samples, all item loadings for each construct are above 0.7, well exceeding the acceptable value 0.5 (Hair et al. 1998), confirming the convergent validity. Meanwhile, the loadings of each item on their respective constructs are much higher than others, demonstrating discriminant validity. In summary, the instruments of the survey show good reliability and validity.

Table 1 also shows the mean value and standard error of each construct across the two groups of respondents. T-test was performed to compare construct value of each independent variable across two groups. No significant difference was found, alleviating the concern that the difference between group members and individual contributors will introduce any bias.

Structural model

Using the overall sample, we first tested the direct effect between the five MOA factors, group membership and knowledge contribution. The results are summarized in Table 2. All the three motivational factors have significant positive effect on knowledge contribution, supporting H1 ($\beta=0.082$, $t=2.44$), H2 ($\beta=0.155$, $t=3.27$) and H3 ($\beta=0.258$, $t=4.37$). The opportunity factor, codification effort, does not show significant effect on knowledge contribution ($\beta=-0.052$, $t=1.31$), rejecting H4. The ability factor, knowledge self-efficacy, exerts significant positive effect on knowledge contribution ($\beta=0.415$, $t=7.74$), supporting H5. Finally, group membership shows significant positive effect on knowledge contributing ($\beta=0.206$, $t=5.47$), supporting H6. All the independent variables and control variables combined explain 59.7% variance in the dependent variable.

Table 2. Structural model for direct effect				
Hypotheses & IV		Overall (N=367), R ² =0.597		Hypothesis test
		β	T-value	
H1	Rewards in reputation system	0.082*	2.44	Supported
H2	Learning	0.155**	3.27	Supported
H3	Enjoy helping	0.258***	4.37	Supported
H4	Codification effort	-0.052	1.31	Not supported
H5	Knowledge self-efficacy	0.415***	7.74	Supported
H6	Group membership	0.206***	5.47	Supported
Control variables				
	Community tenure	-0.005	0.12	N/A
	Gender	-0.015	0.38	N/A
	Education	0.078+	1.93	N/A
	Age	0.045	0.93	N/A

The moderating effect of group membership was tested following Keil et al. (2000) and Ahuja and Thatcher (2005)'s studies by comparing the path coefficients of the same relationships for the two subgroups, i.e. group members and non-group members (for details of comparison, see Appendix B). The path coefficients for the two subgroups as well as path coefficient comparisons are listed in Table 3. Results indicate that rewards in reputation system has significant effect on knowledge contribution for non-group members ($\beta=0.101$, $t=2.08$) but it only shows marginal significant positive effect for group members ($\beta=0.085$, $t=1.81$). However, the comparison of the two path coefficients does not show significant difference ($\Delta\beta=0.016$, $t=1.62$). The second motivation factor, learning, has no significant effect on knowledge contribution for non-group members ($\beta=0.090$, $t=1.28$) but shows significant positive effect on group members ($\beta=0.192$, $t=2.96$). The difference between the two path coefficients is significant

($\Delta\beta=0.102$, $t=14.58$), and as hypothesized the magnitude is larger for group members. The third motivation factor, enjoy helping has no significant effect for non-group members ($\beta=0.079$, $t=1.07$), but it has significant positive effect on group members ($\beta=0.369$, $t=5.37$). The difference between the two sub-groups is significant ($\Delta\beta=0.29$, $t=39.74$), with the magnitude larger for group members as hypothesized. H7 proposes that contributors working in groups are more affected by the three motivations to contribute knowledge compared with contributors working individually. With the difference for rewards in reputation system insignificant but significant for learning and enjoy helping, hypothesis 7 is partially supported.

Codification effort, which represents the opportunity factor, shows significant negative effect for non-group members ($\beta=-0.172$, $t=2.75$). But it has no significant effect for group members ($\beta=-0.050$, $t=0.60$). The difference between the two sub-groups is significant ($\Delta\beta=0.122$, $t=15.59$), with the magnitude larger for non-group members as hypothesized. Thus, H8 is supported. Knowledge self-efficacy, the ability factor shows significant effect for both non-group members ($\beta=0.596$, $t=8.05$) and group members ($\beta=0.344$, $t=5.44$). Further, the magnitude for non-group members is significantly larger than group members ($\Delta\beta=0.252$, $t=35.49$), supporting H9.

Table 3. Structural model for moderating effect								
Hypotheses & IV		Non-group member (N=159), R ² =0.575		Group member (N=208), R ² =0.621		Non-group member vs. group members		Hypothesis test
		β	T-value	β	T-value	β difference	T-value	
H7	Rewards in reputation system	0.101*	2.08	0.085+	1.81	0.016	1.62	Partially supported
	Learning	0.090	1.28	0.192**	2.96	0.102***	14.58	
	Enjoy helping	0.079	1.07	0.369***	5.37	0.290***	39.74	
H8	Codification effort	-0.172**	2.75	-0.050	0.60	0.122***	15.59	Supported
H9	Knowledge self-efficacy	0.596***	8.05	0.344***	5.44	0.252***	35.49	Supported
Control variables								
	Community tenure	-0.044	0.72	0.026	0.59	N/A		
	Gender	-0.001	0.02	-0.012	0.26	N/A		
	Education	0.133*	2.25	0.010	0.21	N/A		
	Age	0.067	0.52	0.021	0.35	N/A		

Discussion

In this research, starting with identifying the behavioral determinants of online Q&A community knowledge contribution against the backdrop of MOA framework, we take the initiative to understand and explain the effect of group feature, an emerging phenomenon in the context of online Q&A community. Several interesting findings can be derived from this study. To start with, group membership can directly boost knowledge contribution. This result demonstrates the effectiveness of group forming in enhancing group members' performance (Ren et al. forthcoming; Simon et al. 1998). Since the group feature is still at its early stage and only a limited number of online Q&A communities have adopted this feature, this finding is highly important. It testifies the significance of this new feature in enhancing members' knowledge contribution, which is crucial for the sustainment of every online Q&A community.

Besides direct effect, the moderating effect of group membership is also largely supported by the finding. To begin with, group members can more effectively convert their motivation to actual behavior, compared

with those who do not join any group. Specifically, they are significantly more affected by the learning motive and enjoy helping motive. This result demonstrates that the beneficial effect of group membership on knowledge contribution is not limited to direct effect, but it can also exert its effect by enhancing the relationship between motivation and behavior. It is in line with the previous finding in the social identity paradigm (Van Knippenberg 2000). However, the difference between group members and non-group members in terms of rewards in reputation system is not significant. It implies this kind of incentive mechanism works equally well for both types of community participants. This fact highlights the importance of this kind of rewards, since while the effect of other motivations may be contingent on participants' membership status; the effect of this motive persists.

Another important finding is that group membership attenuates the negative effect of codification effort. While non-group members are concerned about this opportunity factor, group members forgo the time and effort they need to codify knowledge. This testifies the social identity theory and is also consistent with previous research (Colazo et al. 2009; Kankanhalli et al. 2005).

Moreover, group membership can also negatively moderate the relationship between knowledge self-efficacy and knowledge contribution. Specifically, group members are less affected by their knowledge self-efficacy compared with non-group members. The result is echoed by a previous social identity research which suggests that as group members' self-awareness is weakened, they may take into account group characteristics such as group efficacy (Earley 1993), attenuating the effect of knowledge self-efficacy. In a similar vein, results show that the control variable education level exerts stronger effect on knowledge contribution for non-group members compared with group members. It may have a similar underlying mechanism as knowledge self-efficacy. To be more specific, for non-group members, they are more concerned about their education level. But for group members, as they regard themselves interchangeable with other members in the group due to the depersonalization effect (Hogg 2001), their self-awareness may be weakened. As a result their personal education level plays a less important role.

In addition to testing the effect of group membership, we also find general support for the MOA determinants in affecting users' knowledge contribution. Specially, rewards in reputation system, learning and enjoy helping demonstrate to be three crucial motivations. Knowledge self-efficacy also serves as the significant ability factor that enables knowledge contribution. Although group members do not deem codification effort a great concern, it is still a crucial negative opportunity factor for non-group members.

Implications and limitations

Limitations

The results of this study should be interpreted with several limitations born in mind. First and for most, this survey is done in the context of a specific type of online Q&A community. Given the large variety of online Q&A communities these days, readers should be cautious when generalizing the results to other types of communities. Second, as this study is done in a Chinese context, whether the result can still hold in other countries is an exciting question that we call for further research to answer. Third, as a first step to understand the effect of group membership, this study did not include group dynamics (e.g. group characteristics and group members' relationship) in the model. Understanding how these factors can influence group members' behavior will be a very interesting topic for future research. Fourthly, we use respondents' self-reported data as measurement of the dependent variable in this study. What is more accurate is to retrieve their actual knowledge contribution quantity and quality. We call for future researchers to adopt this approach. Finally, at current stage, we are not able to do a longitudinal study that compares the users' behavior before and after they join groups since it is difficult to track users' group joining behavior in communities. This may potentially compromise the internal validity of this study. However, with sound theoretical backup, we hope this concern can be partially alleviated.

Theoretical implication

This study advances our understanding of online Q&A community knowledge sharing in several ways and therefore makes substantial theoretical contributions. In the first place, it brings into knowledge sharing

literature a new type of user organizational pattern. While previous literature mainly focuses on individual knowledge contribution, this study bridges this gap by leveraging social identity theory to conceptualize the effect of group membership. Compared with previously used theories that account for individual knowledge sharing behavior such as social exchange theory (Kankanhalli et al. 2005; Wasko et al. 2000), social cognitive theory (Chiu et al. 2006; Hsu et al. 2007), and motivation theory (Bock et al. 2005; Wasko et al. 2005), social identity theory is a relatively new perspective to understand and explain this emerging phenomenon. While the direct effect of group membership has been discussed in previous literature (Colazo et al. 2009; Simon et al. 1998), we propose and examine its moderating role, which is not well understood previously. Particularly, we draw from the two social-cognitive processes (categorization and self-enhancement process) invoked by social identity to crystalize the underlying mechanism.

Second, by theorizing and empirically demonstrating the moderating effect of group membership, our study also contributes back to our understanding of the MOA framework by showing that there may be other factors that can change the already known relationship. While previous MOA studies mainly focus on the direct causal relationship between the MOA factors and behavioral outcome in various contexts (e.g. Argote et al. 2003; MacInnis et al. 1991), they generally overlooked contingent factors. This study is an effort to identify group membership as one of the contingent factors that influence the well-established relationship between MOA factors and behavioral outcome, thereby specifying the boundary of this framework.

To sum up, by integrating the MOA framework with the social identity theory, this paper provides a more complete understanding of the knowledge contribution behavior after the introduction of the new group feature. We not only capture the main behavioral determinants in this context but also demonstrate the direct facilitating effect of group membership, its moderating effect in more effectively converting motivation to behavior and finally, its moderating effect in alleviating knowledge contributors' concern about their ability.

Practical implication

This study likewise generates important practical implications for practitioners, especially online Q&A community designers. The group feature we examined is a relatively new feature which only a few online Q&A communities have implemented so far. And the majority of online Q&A communities are still relying on individual knowledge contribution as the dominant knowledge contribution pattern. Community designers may be not yet aware of the benefits of this new feature or are not certain about it. The result of this study sends them an important message that implementing this feature can bring them many benefits as it can not only directly boost knowledge contribution, which they rely on to keep their community running, it can also amplify the effect of motivation and weaken the negative effect of opportunity factor. Therefore community designers should consider implementing this feature to make their online Q&A communities more prosperous. It is worth mentioning that this study is built on the premise that the focal community we investigated has made the group membership salient through its community design and community protocol. Therefore, other community can learn from such Q&A communities in terms of how they have implemented the group feature.

Additionally, as a large number of online Q&A communities are relying on rewards in reputation system as the major incentive mechanism, our result shows that their effort has paid off as rewards in reputation system demonstrate to be significantly associated with knowledge contribution.

Conclusion

This study, built against the backdrop of the MOA framework, mainly examines the effect of group membership, a product of the new group feature in online Q&A communities. Drawing from the social identity theory, we propose the direct and moderating effect of group membership. Our empirical results provide general support for our research model. Particularly, joining a group can directly enhance users' knowledge contribution and it can also amplify the effect of learning motive and enjoy helping motive. Group membership can also weaken the effect of knowledge self-efficacy. Our study brings into the online community literature a new type of user organizational pattern and is able to understand this emerging phenomenon with a relatively new perspective, social identity perspective. By demonstrating the

significance of group membership, we encourage online Q&A community designers to implement the new user organizational pattern to enhance knowledge contribution in their communities.

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Appendix A. Measurement items

Construct	Item wording and code	Source
Rewards in reputation system	<ul style="list-style-type: none"> •I share knowledge to gain more “experience points” in Baidu Knows •I share knowledge to gain more “virtual wealth” in Baidu Knows •I share knowledge to gain higher level in Baidu Knows •I share knowledge to gain higher best answer rate in Baidu Knows 	• Developed based on Kankanhalli, et al.(2005)
Learning	<ul style="list-style-type: none"> •I can maintain my current understanding about certain topics by sharing knowledge in Baidu Knows •I get the chance to exercise my current knowledge by sharing knowledge in Baidu Knows •I can explore my strengths by sharing knowledge in Baidu Knows •I can gain further understanding about certain topics by sharing knowledge in Baidu Knows •I can practice my critical thinking by sharing knowledge in Baidu Knows 	<ul style="list-style-type: none"> • Nam, et al.(2009) • Clary, et al.(1998) • Yu, Jiang, & Chan (2007)
Enjoy helping	<ul style="list-style-type: none"> •I enjoy sharing knowledge with other users in Baidu Knows •I enjoy helping other users by sharing knowledge in Baidu Knows •It feels good to help someone else by sharing knowledge in Baidu Knows •I feel happy when I help other members answer their questions in Baidu Knows 	• Kankanhalli, et al. (2005)
Codification effort	<ul style="list-style-type: none"> •I do not have the time to enter my knowledge in Baidu Knows •The effort is high for me to codify my knowledge in Baidu Knows •It is laborious to codify my knowledge in Baidu Knows •I am afraid that my knowledge sharing will evoke additional clarifications or requests for assistance in Baidu Knows •I am worried that if I share my knowledge, I will have to spend additional time answering follow up questions in Baidu Knows 	• Kankanhalli, et al. (2005)
Knowledge self-efficacy	<ul style="list-style-type: none"> •I have confidence in my ability to provide knowledge that others users consider valuable in Baidu Knows •I have the expertise needed to provide valuable knowledge to others users in Baidu Knows 	• Kankanhalli, et al. (2005)
Knowledge contribution quantity	<ul style="list-style-type: none"> •I often help other users by sharing knowledge in Baidu Knows •I take an active part in Baidu Knows •I have often contributed knowledge in Baidu Knows •I have often shared knowledge with members of Baidu Knows 	• Ma & Agarwal (2007) and Yu et al. (2011)
Knowledge contribution quality	<ul style="list-style-type: none"> •Overall, I think the knowledge I contributed in Baidu Knows is of high quality. •The knowledge I contributed in Baidu Knows is relevant. •The knowledge I contributed in Baidu Knows is timely. •The knowledge I contributed in Baidu Knows is reliable. •The knowledge I contributed in Baidu Knows is easy to understand. •The knowledge I contributed in Baidu Knows is accurate. •The knowledge I contributed in Baidu Knows is complete. 	<ul style="list-style-type: none"> • Developed •Chiu, et al.(2006)

Appendix B. Path coefficient comparison (Keil et al. 2000)

$$S_{pooled} = \sqrt{\{[(N_1 - 1)/(N_1 + N_2 - 2)] \times SE_1^2 + [(N_2 - 1)/(N_1 + N_2 - 2)] \times SE_2^2\}}$$

$$t = (PC_1 - PC_2) / [S_{pooled} \times \sqrt{(1/N_1 + 1/N_2)}],$$

S_{pooled} refers to the pooled estimator of the variance; t refers to the t-value with $N_1 + N_2 - 2$ degrees of freedom; N_1 and N_2 refers to the sample size of the two subgroups; SE_1 and SE_2 refer to the standard error of path in the two groups' structural model; finally, PC_1 and PC_2 refer to the path coefficients in each group's structural model.

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